IX.

THE PHONOGRAPH AND ITS FUTURE.

Of all the writer's inventions, none has commanded such profound and earnest attention throughout the civilized world as has the phonograph. This fact he attributes largely to that peculiarity of the invention which brings its possibilities within range of the speculative imaginations of all thinking people, as well as to the almost universal applicability of the foundation principle, namely, the gathering up and retaining of sounds hitherto fugitive, and their reproduction at will.

From the very abundance of conjectural and prophetic opinions which have been disseminated by the press, the public is liable to become confused, and less accurately informed as to the immediate result and effects of the phonograph than if the invention had been one confined to certain specific applications, and therefore of less interest to the masses. The writer has no fault to find with this condition of the discussion of the merits and possibilities of his invention; for, indeed, the possibilities are so illimitable and the probabilities so numerous that he—though subject to the influence of familiar contact—is himself in a somewhat chaotic condition of mind as to where to draw the dividing line. In point of fact, such line cannot with safety be defined in ordinary inventions at so early a stage of their development. In the case of an invention of the nature and scope of the phonograph, it is practically impossible to indicate it to-day, for to-morrow a trifle may extend it almost indefinitely.

There are, however, certain stages in the developing process which have thus far been actually reached; certain others which are clearly within reach; and others which, though they are in the light of to-day classed as possibilities, may to-morrow become probable, and a little later actual achievements. It is the intention of the writer in this article to confine himself to the

actual and the probable, to the end that a clearer conception of the immediate realizations of the phonograph may be had. He concedes to the public press and the world of science the imaginative work of pointing and commenting upon the possible. It is in view of the liberal manner in which this has already been done, and the handsome treatment he has received at their hands, that he for the first time appears *in propria persona* to discuss and comment upon the merits of one of his own inventions.

In order to furnish a basis upon which the reader may take his stand, and accept or combat the logic of the writer in his presentment of the probabilities of the phonograph, a few categorical questions are put and answers given upon the essential features of the principle involved:

1. Is a vibrating plate or disk capable of receiving a complex motion which shall correctly represent the peculiar property of each and all the multifarious vocal and other sound-waves?

The telephone answers affirmatively.

2. Can such complex movement be transmitted from such plate, by means of a single embossing-point attached thereto, to effect a record upon a plastic material by indentation, with such fidelity as to give to such indentations the same varied and complex form; and, if so, will this embossing-point, upon being passed over the record thus made, follow it with such fidelity as to retransmit to the disk the same variety of movement, and thus effect a restoration or reproduction of the vocal or other sound-waves, without loss of any property essential to producing upon the ear the same sensation as if coming direct from the original source?

The answer to this may be summed up in a statement of the fact that, by the application of power for uniformity of movement, and by attention to many seemingly unimportant and minor details, such as the *form* and material of the embossing-point, the proper *dampening* of the plate, the character of the material embossed, the formation of the mouth-piece over the plate, etc., the writer has at various times during the past weeks reproduced these waves with such degree of accuracy in each and every detail as to enable his assistants to read, without the loss of a word, one or more columns of a newspaper article unfamiliar to them, and which were spoken into the apparatus

when they were not present. The only perceptible loss was found to be in the quality of the utterance—a non-essential in the practical application of the apparatus. Indeed, the articulation of some individuals has been very perceptibly improved by passage through the phonograph, the original utterance being mutilated by imperfection of lip and mouth formation, and these mutilations eliminated or corrected by the mechanism of the phonograph.

3. Can a record be removed from the apparatus upon which it was made, and replaced upon a second without mutilation or loss of effective power to vibrate the second plate?

This is a mere mechanical detail, presenting no greater obstacle than having proper regard for the perfect interchangeableness of the various working parts of the apparatus—not so nice a problem as the manufacture of the American watch.

4. What as to facility of placing and removing the record-sheet, and as to its transportation by mail?

But ten or fifteen seconds suffice for such placing or removal. A special envelope will probably be required for the present, the weight and form of which, however, will but slightly increase the cost of postage.

5. What as to durability?

Repeated experiments have proved that the indentations possess wonderful enduring power, even when the reproduction has been effected by the comparatively rigid plate used for their production. It is proposed, however, to use a more flexible plate for reproducing, which, with a perfectly smooth stone point—diamond or sapphire—will render the record capable of from 50 to 100 repetitions, enough for all practical purposes.

6. What as to duplication of a record and its permanence?

Many experiments have been made with more or less success, in the effort to obtain electrotypes of a record. This work has been done by others, and, though the writer has not as yet seen it, he is reliably informed that, very recently, it has been successfully accomplished. He can certainly see no great practical obstacle in the way. This, of course, permits of an indefinite multiplication of a record, and its preservation for all time.

7. What are the requisite force of wave impinging upon the

diaphragm and the proximity of the mouth to the diaphragm to effect a record?

These depend in a great measure upon the volume of sound desired in the reproduction. If the reproduction is to be made audible to an audience, considerable force is requisite in the original utterance; if for the individual ear, only the ordinary conversational tone (even a whisper has been reproduced). In both cases the original utterances are delivered directly in the mouthpiece of the instrument. An audible reproduction may, however, be had by speaking at the instrument from a distance of from two to three feet in a loud tone. The application of a flaring tube or funnel to collect the sound-waves and the construction of an especially delicate diaphragm and embossing-point, etc., are the simple means which suggest themselves to effect this. The writer has not as yet given this stage of the development much attention, but sees no practical difficulty in gathering up and retaining a sectional part of the sound-waves diffused about the original source, within a radius of, say, three feet (sufficiently removed not to be annoying to a speaker or a singer).

The foregoing presentment of the stage of development reached by the several essential features of the phonograph demonstrates the following as *faits accomplis:*

1. The captivity of all manner of sound-waves heretofore designated as "fugitive," and their permanent retention.

2. Their reproduction with all their original characteristics at will, without the presence or consent of the original source, and after the lapse of any period of time.

3. The transmission of such captive sounds through the ordinary channels of commercial intercourse and trade in material form, for purposes of communication or as merchantable goods.

4. Indefinite multiplication and preservation of such sounds, without regard to the existence or non-existence of the original source.

5. The captivation of sounds, with or without the knowledge or consent of the source of their origin.

The probable application of these properties of the phonograph and the various branches of commercial and scientific industry presently indicated will require the exercise of more or less mechanical ingenuity. Conceding that the apparatus is practi-

cally perfected in so far as the faithful reproduction of sound is concerned, many of the following applications will be made the moment the new form of apparatus, which the writer is now about completing, is finished. These, then, might be classed as actualities; but they so closely trench upon other applications which will immediately follow, that it is impossible to separate them: hence they are all enumerated under the head of probabilities, and each specially considered. Among the more important may be mentioned: Letter-writing, and other forms of dictation books, education, reader, music, family record; and such electrotype applications as books, musical-boxes, toys, clocks, advertising and signaling apparatus, speeches, etc., etc.

Letter-writing.—The apparatus now being perfected in mechanical details will be the standard phonograph, and may be used for all purposes, except such as require special form of matrix, such as toys, clocks, etc., for an indefinite repetition of the same thing. The main utility of the phonograph, however, being for the purpose of letter-writing and other forms of dictation, the design is made with a view to its utility for that purpose.

The general principles of construction are, a flat plate or disk, with spiral groove on the face, operated by clock-work underneath the plate; the grooves are cut very closely together, so as to give a great total length to each inch of surface—a close calculation gives as the capacity of each sheet of foil, upon which the record is had, in the neighborhood of 40,000 words. The sheets being but ten inches square, the cost is so trifling that but 100 words might be put upon a single sheet economically. Still, it is problematical whether a less number of grooves per inch might not be the better plan—it certainly would for letters—but it is desirable to have but one class of machine throughout the world; and as very extended communications, if put upon one sheet, could be transported more economically than upon two, it is important that each sheet be given as great capacity as possible. The writer has not yet decided this point, but will experiment with a view of ascertaining the best mean capacity.

The practical application of this form of phonograph for communications is very simple. A sheet of foil is placed in the phonograph, the clock-work set in motion, and the matter dictated into the mouth-piece without other effort than when dictating to

a stenographer. It is then removed, placed in a suitable form of envelope, and sent through the ordinary channels to the correspondent for whom designed. He, placing it upon his phonograph, starts his clock-work and *listens* to what his correspondent has to say. Inasmuch as it gives the tone of voice of his correspondent, it is *identified.* As it may be filed away as other letters, and at any subsequent time reproduced, it is a perfect *record.* As two sheets of foil have been indented with the same facility as a single sheet, the "writer" may thus *keep a duplicate* of his communication. As the principal of a business house, or his partners now dictate the important business communications to clerks, to be written out, they are required to do no more by the phonographic method, and do thereby *dispense with the clerk,* and *maintain perfect privacy* in their communications.

The phonograph letters may be dictated at home, or in the office of a friend, the *presence* of a stenographer *not being required.* The dictation may be as rapid as the thoughts can be formed, or the lips utter them. The recipient may listen to his letters being read at a rate of from 150 to 200 words per minute, and at the same time busy himself about other matters. Interjections, explanations, emphasis, exclamations, etc., may be thrown into such letters, *ad libitum.*

In the early days of the phonograph, ere it has become universally adopted, a correspondent in Hong-Kong may possibly not be supplied with an apparatus, thus necessitating a written letter of the old-fashioned sort. In that case the writer would use his phonograph simply as a dictating-machine, his clerk writing it out from the phonograph at leisure, causing as many words to be uttered at one time as his memory was capable of retaining until he had written them down. This clerk need not be a stenographer, nor need he have been present when the letter was dictated, etc.

The advantages of such an innovation upon the present slow, tedious, and costly methods are too numerous, and too readily suggest themselves, to warrant their enumeration, while there are no disadvantages which will not disappear coincident with the general introduction of the new method.

Dictation.—All kinds and manner of dictation which will permit of the application of the mouth of the speaker to the

mouth-piece of the phonograph may be as readily effected by the phonograph as in the case of letters. If the matter is for the printer, he would much prefer, in setting it up in type, to use his ears in lieu of his eyes. He has other use for them. It would be even worth while to compel witnesses in court to speak directly into the phonograph, in order to thus obtain an unimpeachable record of their testimony.

The increased delicacy of the phonograph, which is in the near future, will enlarge this field rapidly. It may then include all the sayings of not only the witness, but the judge and the counsel. It will then also comprehend the utterances of public speakers.

Books.—Books may be read by the charitably-inclined professional reader, or by such readers especially employed for that purpose, and the record of such book used in the asylums of the blind, hospitals, the sick-chamber, or even with great profit and amusement by the lady or gentleman whose eyes and hands may be otherwise employed; or, again, because of the greater enjoyment to be had from a book when read by an elocutionist than when read by the average reader. The ordinary record-sheet, repeating this book from fifty to a hundred times as it will, would command a price that would pay the original reader well for the slightly-increased difficulty in reading it aloud in the phonograph.

Educational Purposes.—As an elocutionary teacher, or as a primary teacher for children, it will certainly be invaluable. By it difficult passages may be correctly rendered for the pupil but once, after which he has only to apply to his phonograph for instructions. The child may thus learn to spell, commit to memory, a lesson set for it, etc., etc.

Music.—The phonograph will undoubtedly be liberally devoted to music. A song sung on the phonograph is reproduced with marvelous accuracy and power. Thus a friend may in a morning-call sing us a song which shall delight an evening company, etc. As a musical teacher it will be used to enable one to master a new air, the child to form its first songs, or to sing him to sleep.

Family Record.—For the purpose of preserving the sayings, the voices, and *the last words* of the dying member of the family —as of great men—the phonograph will unquestionably outrank

the photograph. In the field of multiplication of original matrices, and the indefinite repetition of one and the same thing, the successful electrotyping of the original record is an essential. As this is a problem easy of solution, it properly ranks among the probabilities. It comprehends a vast field. The principal application of the phonograph in this direction is in the production of

Phonographic Books.—A book of 40,000 words upon a single metal plate ten inches square thus becomes a strong probability. The advantages of such books over those printed are too readily seen to need mention. Such books would be listened to where now none are read. They would preserve more than the mental emanations of the brain of the author; and, as a bequest to future generations, they would be unequaled. For the preservation of languages they would be invaluable.

Musical-Boxes, Toys, etc.—The only element not absolutely assured, in the result of experiments thus far made—which stands in the way of a perfect reproduction at will of Adelina Patti's voice in all its purity—is the single one of quality, and even that is not totally lacking, and will doubtless be wholly attained. If, however, it should not, the musical-box, or cabinet, of the present, will be superseded by that which will give the voice and the words of the human songstress.

Toys.—A doll which may speak, sing, cry, or laugh, may be safely promised our children for the Christmas holidays ensuing. Every species of animal or mechanical toy—such as locomotives, etc.—may be supplied with their natural and characteristic sounds.

Clocks.—The phonographic clock will tell you the hour of the day; call you to lunch; send your lover home at ten, etc.

Advertising, etc.—This class of phonographic work is so akin to the foregoing, that it is only necessary to call attention to it.

Speech and other Utterances.—It will henceforth be possible to preserve for future generations the voices as well as the words of our Washingtons, our Lincolns, our Gladstones, etc., and to have them give us their "greatest effort" in every town and hamlet in the country, upon our holidays.

Lastly, and in quite another direction, the phonograph will *perfect the telephone*, and revolutionize present *systems of teleg-*

raphy. That useful invention is now restricted in its field of operation by reason of the fact that it is a means of communication which leaves no record of its transactions, thus restricting its use to simple conversational chit-chat, and such unimportant details of business as are not considered of sufficient importance to record. Were this different, and our telephone-conversation automatically recorded, we should find the reverse of the present status of the telephone. It would be expressly resorted to *as* a means of perfect record. In writing our agreements we incorporate in the writing the summing up of our understanding—using entirely new and different phraseology from that which we used to express our understanding of the transaction in its discussion, and not infrequently thus begetting perfectly innocent causes of misunderstanding. Now, if the telephone, with the phonograph to record its sayings, were used in the preliminary discussion, we would not only have the full and correct text, but every word of the whole matter capable of throwing light upon the subject. Thus it would seem clear that the men would find it more advantageous to actually separate a half-mile or so in order to discuss important business matters, than to discuss them verbally, and then make an awkward attempt to clothe their understanding in a new language. The logic which applies to transactions between two individuals in the same office, applies with the greater force to two at a distance who must discuss the matter between them by the telegraph or mail. And this latter case, in turn, is reënforced by the demands of an economy of time and money at every mile of increase of distance between them.

"How can this application be made?" will probably be asked by those unfamiliar with either the telephone or phonograph.

Both these inventions cause a plate or disk to vibrate, and thus produce sound-waves in harmony with those of the voice of the speaker. A very simple device may be made by which the one vibrating disk may be made to do duty for both the telephone and the phonograph, thus enabling the speaker to *simultaneously transmit and record his message.* What system of telegraphy can approach that? A similar combination at the distant end of the wire enables the correspondent, if he is present, *to hear it while it is being recorded.* Thus we have a mere passage of words for the action, but a complete and durable record

of those words as the result of that action. Can economy of time or money go further than to annihilate time and space, and bottle up for posterity the mere utterance of man, without other effort on his part than to speak the words?

In order to make this adaptation, it is only requisite that the phonograph shall be made slightly more sensitive to record, and the telephone very slightly increased in the vibrating force of the receiver, and it is accomplished. Indeed, the "Carbon Telephone," invented and perfected by the writer, will already well-nigh effect the record on the phonograph; and, as he is constantly improving upon it, to cause a more decided vibration of the plate of the receiver, this addition to the telephone may be looked for coincident with the other practical applications of the phonograph, and with almost equal certainty.

The telegraph company of the future—and that no distant one—will be simply an organization having a huge system of wires, central and sub-central stations, managed by skilled attendants, whose sole duty it will be to keep wires in proper repair, and give, by switch or shunt arrangement, prompt attention to subscriber No. 923 in New York, when he signals his desire to have private communication with subscriber No. 1001 in Boston, for three minutes. The minor and totally inconsequent details which seem to arise as obstacles in the eyes of the groove-traveling telegraph-man, wedded to existing methods, will wholly disappear before that remorseless Juggernaut—"the needs of man;" for, will not the necessities of man surmount trifles in order to reap the full benefit of an invention which practically brings him face to face with whom he will; and, better still, doing the work of a conscientious and infallible scribe?

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